

REMARKS

Claims 3-7, 9, 12-16 and 28-34 are pending in the present application. Claims 3-7, 9, 12 and 28 have been amended. Claims 33 and 34 have been presented herewith. Claims 1, 2, 8, 10, 11 and 17-27 have been canceled. Applicant reserves the right to file a divisional application including canceled claims 17-25.

Priority Under 35 U.S.C. 119

Applicant notes the Examiner's acknowledgment of the Claim for Priority under 35 U.S.C. 119, and receipt of the certified copy of the priority document.

Drawings

Applicant notes the Examiner's acceptance of the drawings as filed along with the present application on January 29, 2004.

Information Disclosure Statements

An Information Disclosure Statement has been filed concurrently herewith. The references listed were cited in copending U.S. application Serial No. 11/230,525, which includes subject matter that is related to the present application. The listed references may thus be considered material to the examination of the present application. **The Examiner is respectfully requested to acknowledge receipt of the Information Disclosure Statement, and to confirm that the documents listed therein have been**

considered and will be cited of record in the present application.

Claim Rejections-35 U.S.C. 102

Claims 1 and 8 have been rejected under 35 U.S.C. 102(b) as being anticipated by the Ngo et al. reference (U.S. Patent No. 6,329,701). Claims 1 and 8 have been canceled. The Examiner is therefore respectfully requested to withdraw this rejection.

Claims 1, 2 and 5-9 have been rejected under 35 U.S.C. 102(e) as being anticipated by the Geffken et al. reference (U.S. Patent No. 6,680,514). Claims 1, 2 and 8 have been canceled. Claims 5-7 and 9 are dependent upon claim 3. Accordingly, the Examiner is respectfully requested to withdraw this rejection for at least these reasons.

Claim Rejections-35 U.S.C. 103

Claims 1-16 and 26-32 have been rejected under 35 U.S.C. 103(a) as being unpatentable over the Lim et al. reference (U.S. Patent No. 6,380,084) in view of the Geffken et al. reference. This rejection, insofar as it may pertain to the presently pending claims, is traversed for the following reasons.

The wiring structure of a semiconductor device of claim 3 includes in combination among other features plural cap films "formed at least on upper faces of the wiring films, and which are each separated by the grooves, wherein the cap films are formed on parts protruding above the interface and are separated from each other

by the interface, and wherein the cap films are formed only on uppermost faces of the wiring films and the barrier films". Applicant respectfully submits that the prior art as relied upon by the Examiner would not make obvious these features.

The Examiner has relied primarily upon Fig. 14 of the Lim et al. reference as meeting the features of previously pending claims 1 and 2. The Examiner has acknowledged that the Lim et al. reference fails to include plural cap films. In an effort to overcome this acknowledged deficiency, the Examiner has relied on Fig. 6 of the Geffken et al. reference, and has asserted with respect to previously pending claim 3 that "the cap films taught by Geffken will be formed only on the upper faces of the wiring films (84) and the barrier films (80)" (our emphasis added). Applicant respectfully disagrees for at least the following reasons.

As noted above, the Examiner has interpreted metallic cap 79 in Fig. 6 as the plural cap films of current claim 3, and has asserted that the metallic cap "will be formed" only on upper faces of wiring films and barrier films of the combined device. However, metallic cap 79 is shown in Fig. 6 of the Geffken et al. reference as formed on the upper surface of conductive stud 63, the upper surface of conductive liner 67, and most significantly on side surfaces of conductive liner 67 which protrude above insulating material 49. The prior art as relied upon by the Examiner does not disclose or suggest cap films that are, or "will be formed" as asserted by the Examiner, only on uppermost faces of wiring films and barrier films, as would be necessary to meet the features of claim 3. The prior art as relied upon by the Examiner would not reduce

parasitic capacitance between wiring as in the wiring structure of claim 3. Applicant therefore respectfully submits that the wiring structure of a semiconductor device of claim 3 would not have been obvious in view of the prior art as relied upon by the Examiner taken singularly or together, and that this rejection, insofar as it may pertain to claims 3-7 and 9, is improper for at least these reasons.

The wiring structure of a semiconductor device of claim 12 includes in combination among other features a first insulating film "having plural grooves formed therein, which has an interface in a horizontal direction between adjoining grooves". As further featured, "the first insulating film has plural protrusions protruding from the interface, and the grooves are formed in the protrusions, wherein the upper faces of the wiring films and the barrier films are substantially coincident with upper ends of the grooves, and wherein the protrusions are formed through etching the first insulating film, using the cap films as a mask, and the cap films have substantially the same shape as uppermost faces of the protrusions". Applicant respectfully submits that the prior art as relied upon by the Examiner would not make obvious these features.

As noted above, the Examiner has relied on the combination of Fig. 14 of the Lim et al. reference as taken with Fig. 6 of the Geffken et al. reference. However, metallic cap 79 in Fig. 6 of the Geffken et al. reference is shown as formed on a top surface of conductive stud 63, a top surface of conductive liner 67, and side surfaces of conductive liner 67 which extend above insulative material 49. Metallic cap 79 in Fig. 6 of the Geffken et al. reference therefore has a shape similar to an inverted letter u.

Applicant respectfully submits that it is not clear how the Fig. 14 structure of the Lim et al. reference could be modified to incorporate metallic cap 79 of the Geffken et al. reference. Particularly, since copper layer 84 and barrier layer 80 in Fig. 14 of the Geffken et al. reference are embedded within dielectric layer 72 and do not protrude therefrom, so that side surfaces of copper layer 84 and barrier layer 80 are not exposed, it is not clear how inverted u-shaped metallic cap 79 of the Geffken et al. reference could be used in connection with the structure of the Lim et al. reference. Regardless, even if proper motivation existed for combining the teachings and assuming that the teachings could somehow be combined (which Applicant does not concede), metallic cap 79 of the Geffken et al. reference would not have substantially the same shape as an uppermost face of the hillock shown in Fig. 14 of the Lim et al. reference, as would be necessary to meet the features of claim 12. Applicant therefore respectfully submits that the wiring structure of a semiconductor device of claim 12 would not have been obvious in view of the prior art as relied upon by the Examiner taken singularly or together, and that this rejection, insofar as it may pertain to claims 12-16, is improper for at least these reasons.

The wiring structure of a semiconductor device of claim 28 includes in combination among other features a first insulating film "having plural protrusions in which grooves are formed, and which has an interface in a horizontal direction between adjoining protrusions"; plural first cap films "formed on upper faces of the protrusions"; and second cap films "formed on the first cap films and the first insulating film". As

further featured, "the protrusions are formed through etching the first insulating film, using the first cap films as a mask, and the first cap films have substantially the same shape as uppermost faces of the protrusions".

The Examiner has relied upon Fig. 14 of the Lim et al. reference in combination with Figs. 6 and 7 of the Geffken et al. reference. However, as asserted above with respect to claim 12, metallic cap 79 of the Geffken et al. reference would not have substantially the same shape as an uppermost face of the hillock shown in Fig. 14 of the Lim et al. reference, as would be necessary to meet the features of claim 28. Applicant respectfully submits that the wiring structure of a semiconductor device of claim 28 would not have been obvious in view of the prior art as relied upon by the Examiner taken singularly or together, and that this rejection, insofar as it may pertain to claims 28-32, is improper for at least somewhat similar reasons as set forth with respect to claim 12.

Double Patenting Rejection

Claims 1, 2 and 5-9 have been rejected on the grounds of non-statutory obviousness-type double patenting as being unpatentable over claims 1 and 7-12 of U.S. Patent No. 6,969,911. Since claims 1, 2 and 8 have been canceled, and since claims 5-7 and 9 are currently dependent on claim 3, this double patenting rejection as set forth is no longer applicable. The Examiner is therefore respectfully requested to withdraw this rejection for at least these reasons.

Conclusion

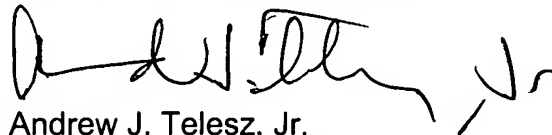
The Examiner is respectfully requested to reconsider and withdraw the corresponding rejections, and to pass the claims of the present application to issue, for at least the above reasons.

In the event that there are any outstanding matters remaining in the present application, please contact Andrew J. Telesz, Jr. (Reg. No. 33,581) at (571) 283-0720 in the Washington, D.C. area, to discuss these matters.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment for any additional fees that may be required, or credit any overpayment, to Deposit Account No. 50-0238.

Respectfully submitted,

VOLENTINE FRANCO & WHITT, P.L.L.C.

A handwritten signature in black ink, appearing to read 'Andrew J. Telesz, Jr.', with a stylized flourish at the end.

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